MAJOR LAND PERMIT APPLICATION

Environmental Assessment Report

Applicant: Government of the US Virgin Islands – Dept. of Public Works
Project: VI ST ER STX(003): Storm Damage Repair to Roadways, Culverts, Embankments, Bridges, and Other Roadway Features on St. Croix, USVI

Site: Rt. 82 MP-3.5 - East End Rd. Cotton Valley

JANUARY 2022

Prepared by: Tysam Tech, LLC

Tysam Tech, LLC

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1.00 NAME AND ADDRESS OF APPLICANT

Government of the US Virgin Islands
Department of Public Works

Mailing Address:
6002 Annas Hope
Christiansted, VI 00820

Physical Address:
6002 Annas Hope
Christiansted, VI 00820

2.00 LOCATION OF PROJECT

The project is located at the following physical address:

Rt. 82 MP-3.5 East End Rd. Cotton Valley
Christiansted, VI 00820

Rt. 82 MP-3.5 East End Road is located in the estate of Cotton Valley on St. Croix. The project site is located at 17°45'32.4"N 64°37'24.4"W, along Route 82, East End Road. The Location and Agency Review Map in Figure 2.00.1 below (project location indicated by northern point) and Figure 2.00.2 establishes the areas of Coastal Zone Management (CZM) first tier jurisdiction.

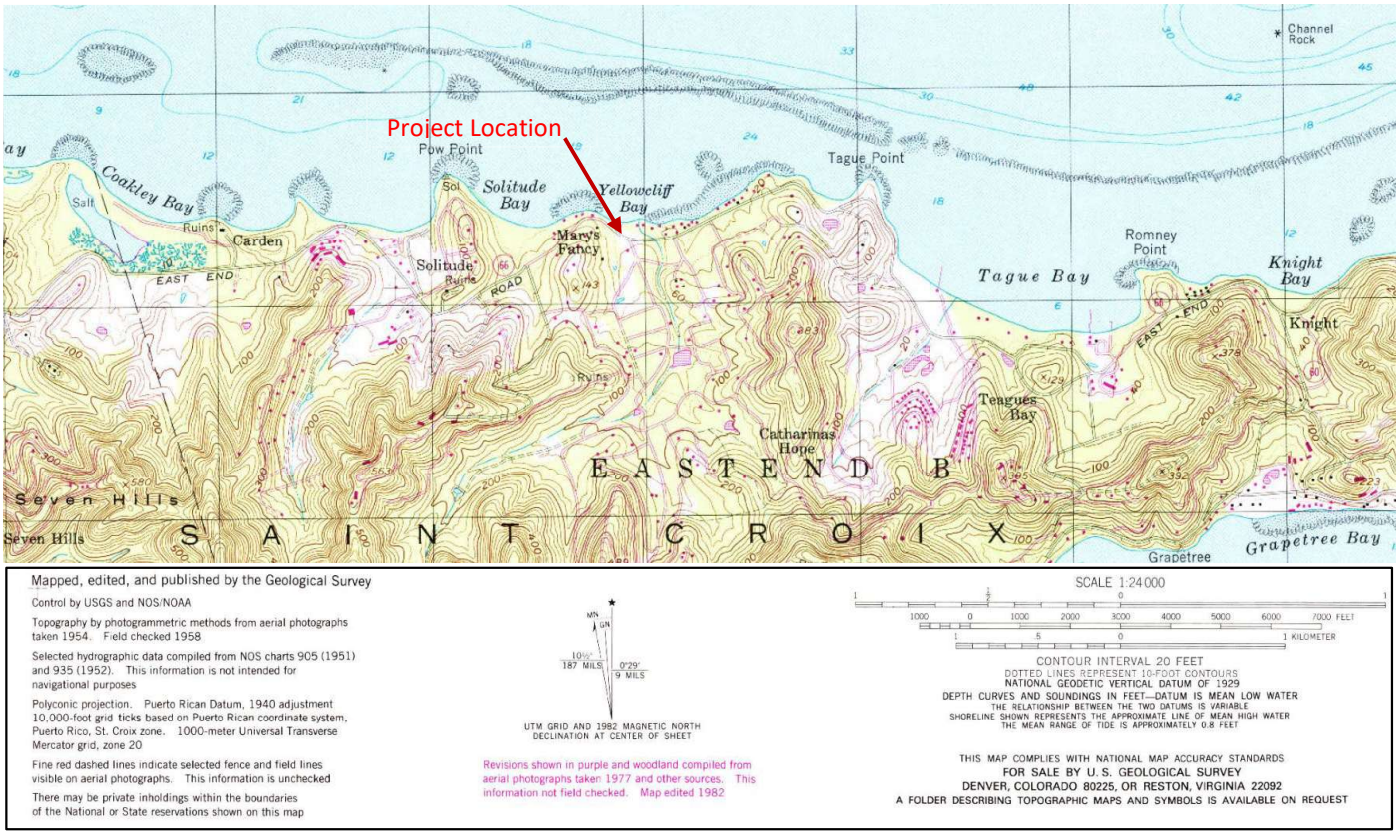


Figure 2.00.1 – Location and Agency Review Ma p(USGS Quadrangle Map, East End B, 1958)

Figure 2.00.2 –Vicinity Map Showing Location of Facility within Tier 1 Territory (Google Earth).

3.00 ABSTRACT

Significant damage to roads, gut crossings and bridges occurred as a result of the landfall of Hurricane Maria in 2017 to the island of St. Croix, USVI. To provide the necessary repair to the damaged infrastructure, the USVI Department of Public Works (DPW) has contracted VI Paving, Inc. (VIP) to undertake the repairs at 15 different sites around St. Croix. These sites consist of different types of rehabilitation work, and different project scale. Of the 15 sites, there are 3 Bridge Rehab Sites, 7 Culvert Rehab Sites, and 5 Roadway Rehab Sites. This project is funded through the US Department of Transportation (USDOT), Federal Highway Administration, Eastern Federal Lands Highway Division and is in partnership with the USVI Department of Public Works (DPW).

The project consists of the removal of damaged asphalt and concrete pavement, pipe culverts, guardrail, retaining walls, embankment material, utility lines and poles, bridges, and other debris; and the installation of aggregate base, asphalt pavement, concrete pavement, pipe culverts, guardrail, gabion or concrete retaining wall, embankment stabilization, riprap, paved waterway, headwall, drainage inlets, cleaning drainage structures, reconditioning shoulders and ditches, replacing bridges, culvert, and utilities to provide fully functional roads, drainage systems, bridges, and utilities, complete and in place.

For this particular site under project VI ST ER STX(003), 200 linear feet of roadway at MP 3.5 on Route 82 will be rehabilitated and raised in order to allow for larger drainage culverts. The existing cast iron 30-inch culvert will be removed and replaced with a 4'x8' box culvert. A concrete headwall on the shoreside of the roadway will be installed and the damaged guardrail will also be removed and replaced. Due to significant shoulder erosion on the eastern shoulder caused by stormwater during Hurricane Maria, rip rap and gabion baskets will be installed on this shoulder and culvert outlet to provide improved stability and protection of the road edge.

Project Assurances

- Employees' and the public's health and safety are protected with the best available systems and technologies.
- Environmental impact is considered at all times.
- No significant negative impact to environment.
- Air quality is protected.
- Stormwater quality is protected.
- Nearshore water quality is protected.

4.00 STATEMENT OF OBJECTIVES SOUGHT BY THE PROPOSED PROJECT

VIP seeks to repair and rehabilitate the referenced section of roadway, existing culvert, headwalls, and guardrail which was compromised due to storm damage from Hurricane Maria. In order to prevent future damage to the roadway and related infrastructure, the existing culverts will be replaced, resulting in an increased area for stormwater drainage, and the eastern shoulder will be protected from future flooding events by installation of gabion basket and rip rap structures.

5.00 DESCRIPTION OF PROJECT

5.01 SUMMARY OF PROPOSED ACTIVITY

a) Purpose of Project

The purpose of the project is to rehabilitate a 200-foot section of roadway which was damaged from Hurricane Maria in 2017. In addition to the damaged roadway, the cast iron culvert and damaged guardrail will need replacement. To protect this section from future storm damage, the road will be raised to accommodate a larger box culvert and rip rap and gabion baskets will be added to the east side of the roadway shoulder and in the culvert outlet.

b) Presence and Location of any Critical Areas and Possible Trouble Spots

The project area is directly adjacent to the shoreline, with several properties in the vicinity. Due to the proximity to the water, the clearing of debris and repair of the roadway must not cause any impact to the surrounding areas.

Site slope is minimal at 2-5%. However, there are some dramatic increases of 40-70% slope just off the road footprint along the gut and stormwater channel. Elevation average is 15 feet above sea level.

A review of Endangered Species in the area, using the USFWS Information for Planning and Consultation (IPaC) Tool, indicates there are no endangered terrestrial species within the proposed project site but identifies two federal endangered sea turtle species that are known to swim in the offshore waters north of the project area. These include: hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) turtles. In addition, the

West Indian Manatee (Trichechus manatus) has also been found in the offshore water near the project site and are a threatened species.

In review of the 2018 VI DPNR Integrated Report, water quality in the area has been designated as currently Unknown due to lack of sampling stations in the area.

Due to the nature of the project scope of road rehabilitation, there exists potential for sedimentation and erosion during project activities. However, appropriate protective Best Management Practices (BMPs) will be employed through the entire project timeline in accordance with minimum requirements of the VI Environmental Protection Handbook (2002), and as the project footprint is essentially identical to the existing infrastructure, there are no anticipated impacts to stormwater and air quality.

These BMPs chosen will meet the minimum standards of the VI Environmental Protection Handbook (2002).

c) *Proposed Method of Land Clearing*

The brush and debris will be removed by cutting vegetation and removing it off-site as green waste for disposal at the Waste Management Authority Transfer Station. Earth work will be limited to scraping road surface, excavating the culvert, and grading the washed out road shoulder.

d) *Plans for Topsoil and Site Disturbance Provisions*

Topsoil and site disturbance will be minimized during the construction timeline. The project will stay almost exclusively within the existing footprint of the road along the 200-foot length, with the exception of rip rap and gabion basket reinforcement to the eastern shoulder.

Some soil removal and compaction will occur along the north/east edge of the road, to stabilize for the additional rip rap placement, but will be protected and stabilized throughout the project timeline. Shoulder grading and shaping will occur to achieve correct profile for long-term drainage.

The site will otherwise see no topsoil or site disturbance, and compaction of subbase will occur before asphalt layers are placed down.

A Storm Water Pollution Prevention Plan (SWPPP) complying with the Department of Planning and Natural Resources' Construction General Permit requirements will be implemented during project activities.

e) Erosion and Sediment Control Devices to be Implemented

The following Best Management Practices (BMPs) will be implemented on the site to control runoff and protect natural resources:

Silt Fence – Due to the close proximity to the shoreline, silt fencing shall be used to protect the shoreline and surface water from runoff and sediment loss on the north side along the beach/sand line.

Containment Berms– A containment berm will be constructed if needed to support silt fencing in containing stormwater and retaining sediment.

Design of these BMPs will follow the minimum standards of the VI Environmental Protection Handbook (2002).

f) Schedule for Earth Changing Activities & Implementation of Erosion/Sediment Control Measures

No earth change activities will take place until the BMPs are installed at the site. Erosion and sediment control for the Site Project construction include:

1. Ensure silt fencing and other BMPs are setup before work begins.
2. Minimize earth work in the removal of the existing cast iron culvert and replacement with a box culvert.
3. Minimize time for installation of concrete headwall and guardrail.
4. Minimize re-stabilization time for shoulder and culvert outlet to install additional riprap and gabion baskets.
5. Compact and re-asphalt the road before removing silt fencing and/or berms.

g) Maintenance of Erosion and Sediment Control

Sediment control devices, including dikes swales, and outlets, will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed in accordance with the approved SWPPP requirements.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing. Worn, torn or otherwise damaged silt fencing will be fixed or replaced.

The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

h) Stormwater Management

No proposed changes to stormwater flows, quantities or direction are proposed for this project, with the exception of a new box culvert to provide more cross-sectional area for flow to pass under the road during heavy rain events.

Management of stormwater for the duration of the project will be limited to ensuring no discharge of contaminated stormwater from the site boundaries, and prevention of erosion of project areas through controlled release from site discharge points.

Erosion and Sediment control devices will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of sediment catchment basin. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

i) Maintenance Schedule of Stormwater Facilities

Sediment control devices, including dikes swales, and outlets, will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing, and in accordance with the approved SWPPP requirements. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

j) Sewage Disposal

Project sewage management will be limited to maintaining portable restrooms on site, and ensuring they are emptied by a qualified waste management company at an appropriate frequency to minimize spills or discharges from the site.

There are no existing sewer lines (either private or municipal) in the area. The proposition of the installation of sewage system, units or piping is outside of the scope of this project.

5.02 SITE PLANS (See Attached Drawings)

5.02.01 Lot Layout (See Attached Engineer/Surveyor drawings)

5.02.02 Road Layouts (See Attached Engineer/Surveyor drawings)

5.02.03 Position of Structures (See Attached Engineer/Surveyor drawings)

5.02.04 Septic System/wastewater Treatment (Not Applicable)

5.02.05 Stormwater Drainage (See Attached Engineer/Surveyor drawings)

5.02.06 Stormwater Facilities (See Attached Engineer/Surveyor drawings)

5.02.07 Erosion and Sediment Control Plan (See Attached Engineer/Surveyor drawings)

5.02.08 Landscaping Plan (Not Applicable)

5.02.09 Other Required Drawings (See Attached Engineer/Surveyor drawings)

5.02.10 Required Maps (See Included in EAR: Official Zoning Map, Parcel Map, FIRM)

5.03 PROJECT WORKPLAN

The project is proposed to be performed as 4 Phases, in sequential order with some overlapping tasks. It will entail Site preparation and mobilization, demolition and earth work, construction and finally demobilization and cleanup.

Phase 1 – Site Preparation

This phase will consist of mobilization and initial survey and staking. After layout determination and establishment, Erosion & Sediment control will be set up, along with Traffic and Pedestrian Control Plan that will follow Maintenance of Traffic (MOT) requirements set forth by USDOT. Mobilization of machinery and equipment will follow proper site setup for safety and protection of workers and environment.

Approximate Timeline – 14-21 days

Phase 2 – Demolition

This phase will begin with initial site clearing and basic grubbing to prepare for demolition. Vegetation will be removed and sent to the WMA Transfer station for green waste. Demolition of the culvert, headwall and existing road structure will occur next, with C&D waste disposed of in the Anguilla Landfill via permitted dump trucks. After full demolition and removal of C&D waste, grading and excavation of soil and substrate will commence to prepare new structures for installation.

Approximate Timeline – 21 days

Phase 3 – Earth and Culvert Construction

This phase will entail construction and installation of gabion baskets, embankment shaping and setting, culvert installation and headwall casting. Inlet and Outlet modification and installation will complete the infrastructure layout.

Approximate Timeline – 21 days

Phase 4 – Roadway Construction

This final phase will focus on roadway construction and profile. Aggregate base will be laid over newly installed infrastructure. New safety guardrails will be installed according to included site plan drawings, and final asphalt layers will be applied per road construction specifications, to provide correct profile for safe driving conditions and to allow for proper drainage and storm resistance. Finally, installation of signage and pavement markings will complete the construction work, and the site will be stabilized and closed through any necessary landscaping and site cleanup as required by environmental standards and regulation.

Approximate Timeline – 21 days

All work on this road project will follow Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, as well as local building, environmental and safety regulations.

Total estimated time for construction completion is estimated at 90 days.

6.00 SETTING AND PROBABLE PROJECT IMPACT ON THE NATURAL ENVIRONMENT

6.01 CLIMATE AND WEATHER

Prevailing Winds

The Virgin Islands lie in the "Easterlies" or "Trade Winds" that traverse the southern part of the "Bermuda High" pressure area, and the predominant winds are usually from the east-northeast and east (IRF, 1977). These trade winds vary seasonally and are broadly divided into 4 seasonal modes: 1) December to February; 2) March to May; 3) June to August; and 4) September to November. Below are the characteristics of these modes as taken from Marine Environments of the Virgin Islands Technical Supplement No. 1 (IRF, 1977), and based on U.S. Naval Oceanographic Office data.

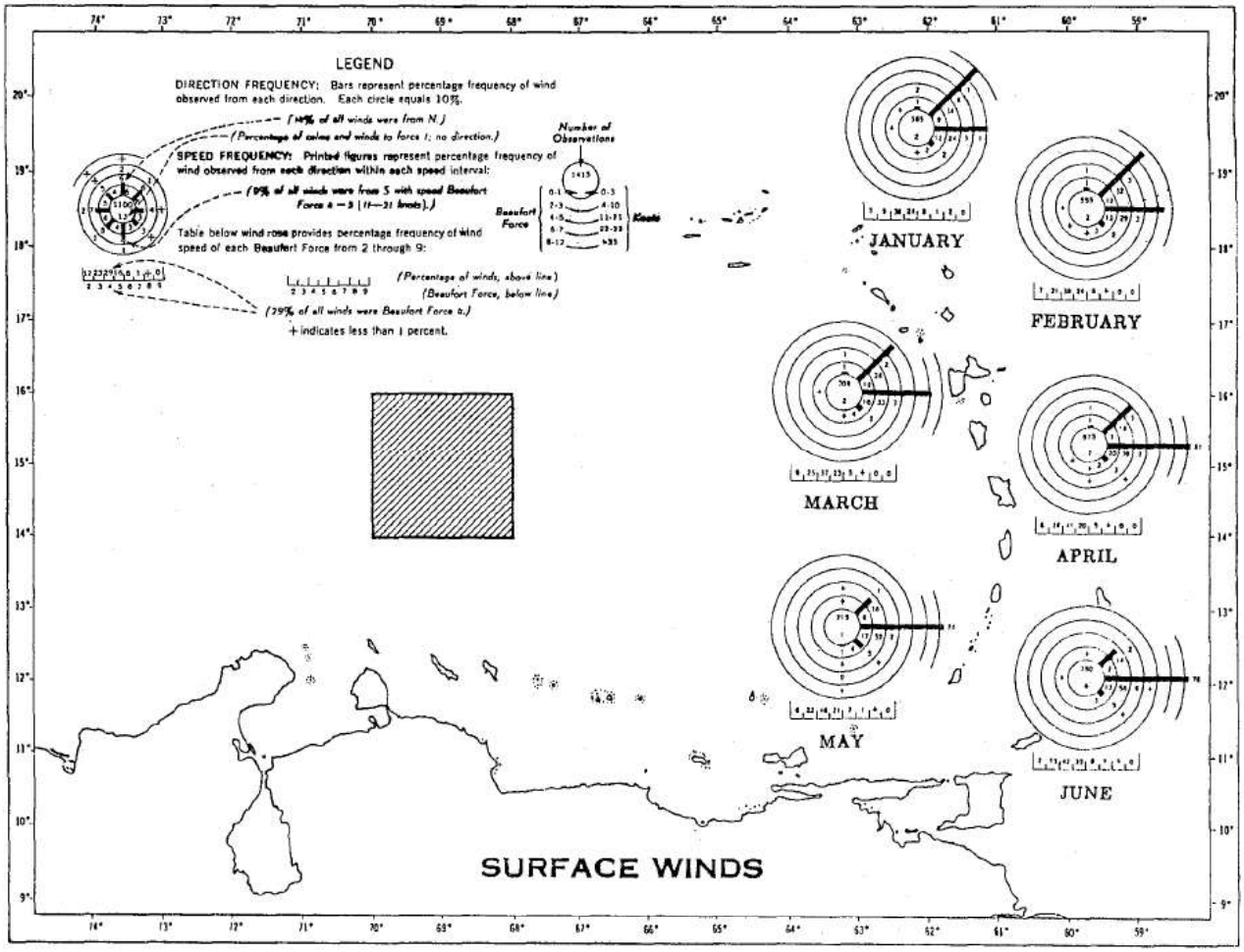


Figure 6.01.1 –Wind Direction and Speed Frequency, Central Caribbean, January - June.

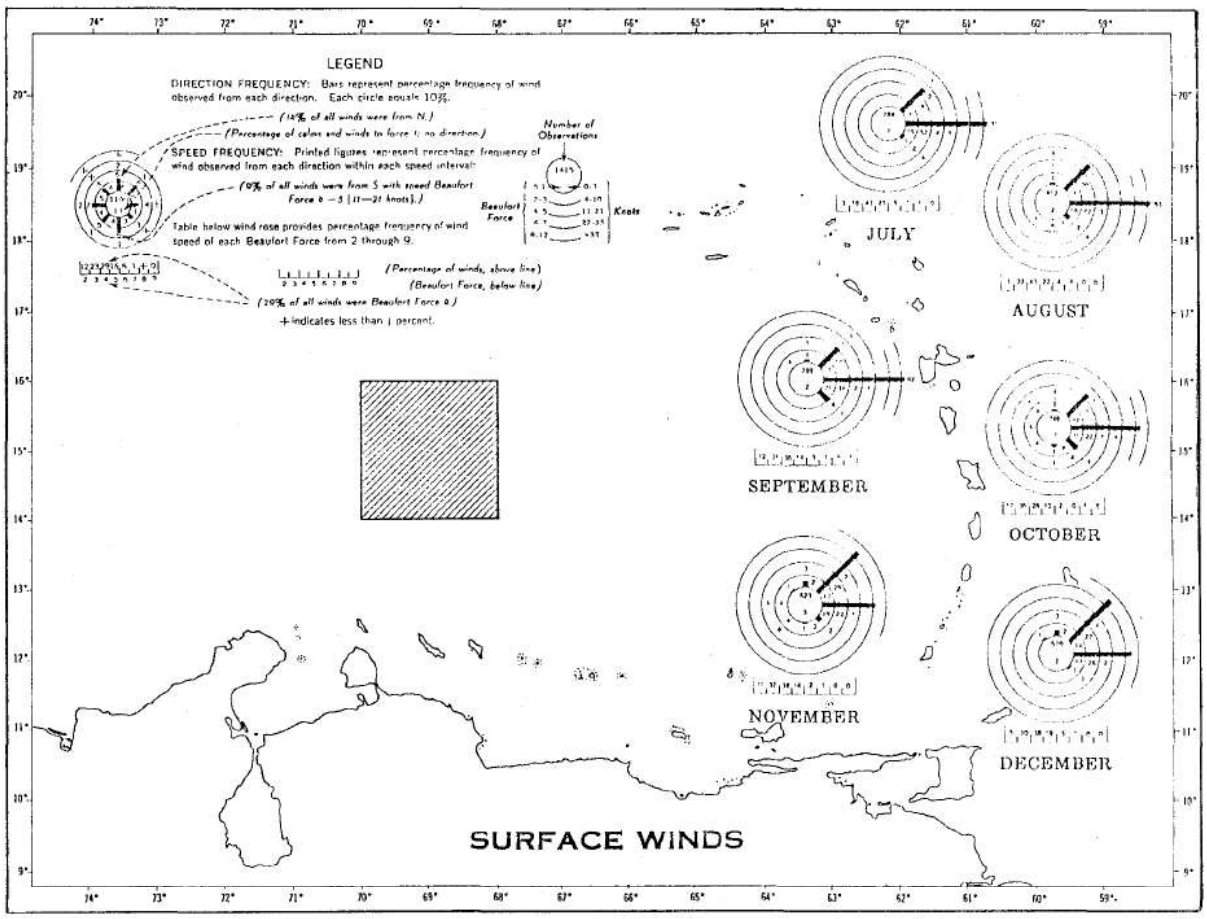


Figure 6.01.2 –Wind Direction and Speed Frequency, Central Caribbean, July - December.

December – February

During the winter, the trade winds reach a maximum and blow with great regularity from the east-northeast. Wind speeds range from eleven to twenty-one knots about sixty percent of the time in January. This is a period when the Bermuda High is intensified with only nominal compensation pressure changes in the Equatorial Trough. The trade winds during this period are interrupted by "Northerners" or "Christmas Winds," which blow more than twenty knots from a northerly direction in gusts from one to three days. Such outbreaks average about thirty each year. They are created by strengthening of high-pressure cells over the North American continent, which, in turn, allow weak cold fronts to move southeastward over the entire Caribbean region. These storms are accompanied by intermittent rains, clouds and low visibility.

March – May

During the spring, the trade winds are reduced in speed and blow mainly from the east. Winds exceed twenty knots only thirteen percent of the time in April. The change in speed and direction is the result of a decrease of the Equatorial Trough.

June – August

Trade winds reach a secondary maximum during this period and blow predominantly from the east to east-southeast. Speeds exceed twenty knots twenty-three percent of the time during July. The trend for increasing winds results from the strengthening of the Bermuda High and a concurrent lowering of the pressure in the Equatorial Trough. Trade winds during this period are interrupted by occasional hurricanes.

September – November

During the fall, winds blow mainly from the east or southeast and speeds reach an annual minimum. Only seven percent of the winds exceed twenty knots in October. The low speeds result from a decrease in the Equatorial Trough. During this period, especially during late August through mid-October, the normal trade wind regime is often broken down by easterly waves, tropical storms and hurricanes.

Storms and Hurricanes

There are numerous storm events each year, from squalls and thunderstorms to hurricanes. Standard rain events occur most frequently during the summer, lasting only a few hours and causing no pronounced change in the trade winds.

A tropical cyclone whose winds exceed 74 miles per hour is termed a hurricane in the northern hemisphere and can range in strength from causing little to no damage, to destroying. These hurricanes occur most frequently between August and mid-October with their peak activity occurring in September.

Figure 6.01.3 depicts NOAA data on historic Hurricanes and Tropical Storms in the vicinity of St. Croix.

Figure 6.01.3 – Historic Tracks of Hurricanes and Tropical Storms for St. Croix

Climate

The climate of St. Croix, as well as that of the Territory, is characterized by generally fair, tropical weather, with usually consistent wind speed and direction. Temperature swings are narrow, both seasonally and diurnally.

The closest weather station to the facility is Christiansted Ft. Climate data from this station is found below in Table 6.01.1.

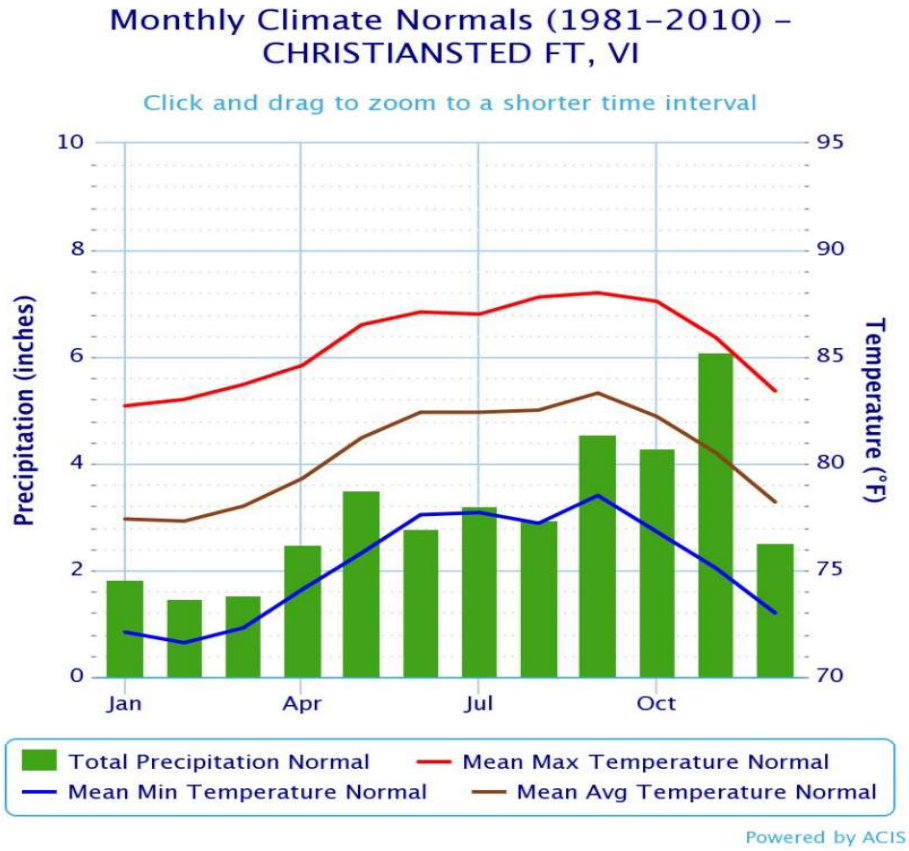


Table 6.01.1 –Average Temperatures in Christiansted, St. Croix

The nearest NOAA National Ocean Service Weather Station is located in Christiansted Harbor, St. Croix (Station CHSV3 – 9751364; ndbc.noaa.gov/station_page.php?station=chsv3). Climate data from this station is found below in Tables 6.01.2 and 6.01.3 below.

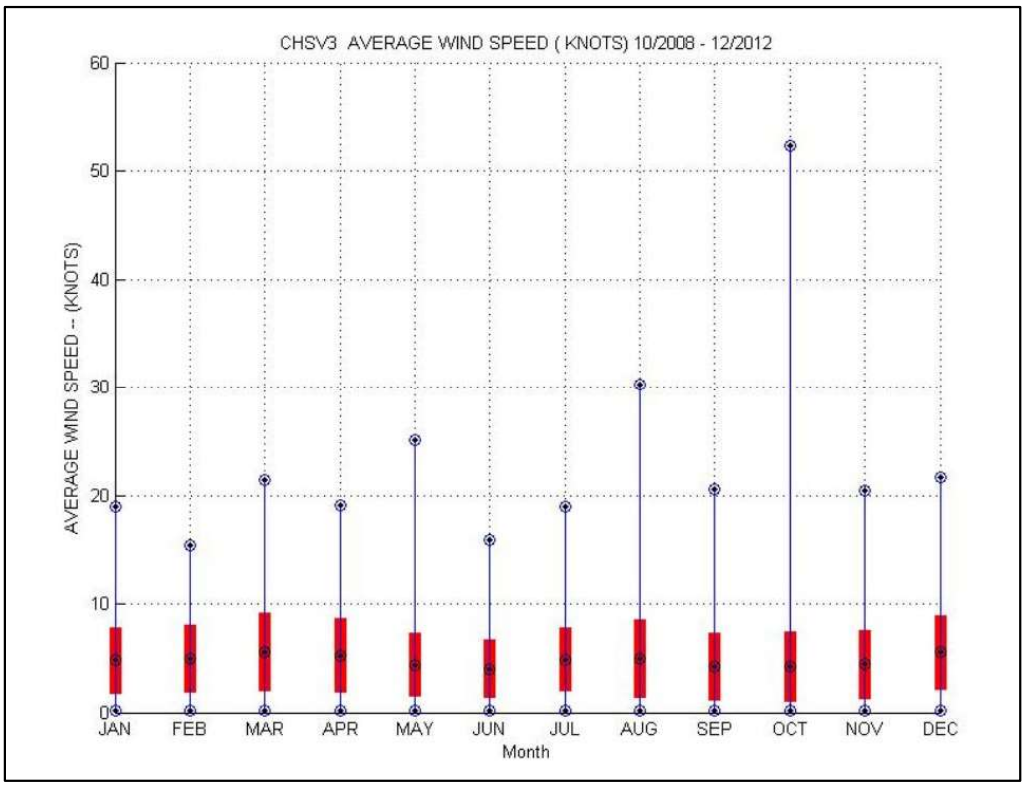


Table 6.01.2 – Average Wind Speed, St. Croix

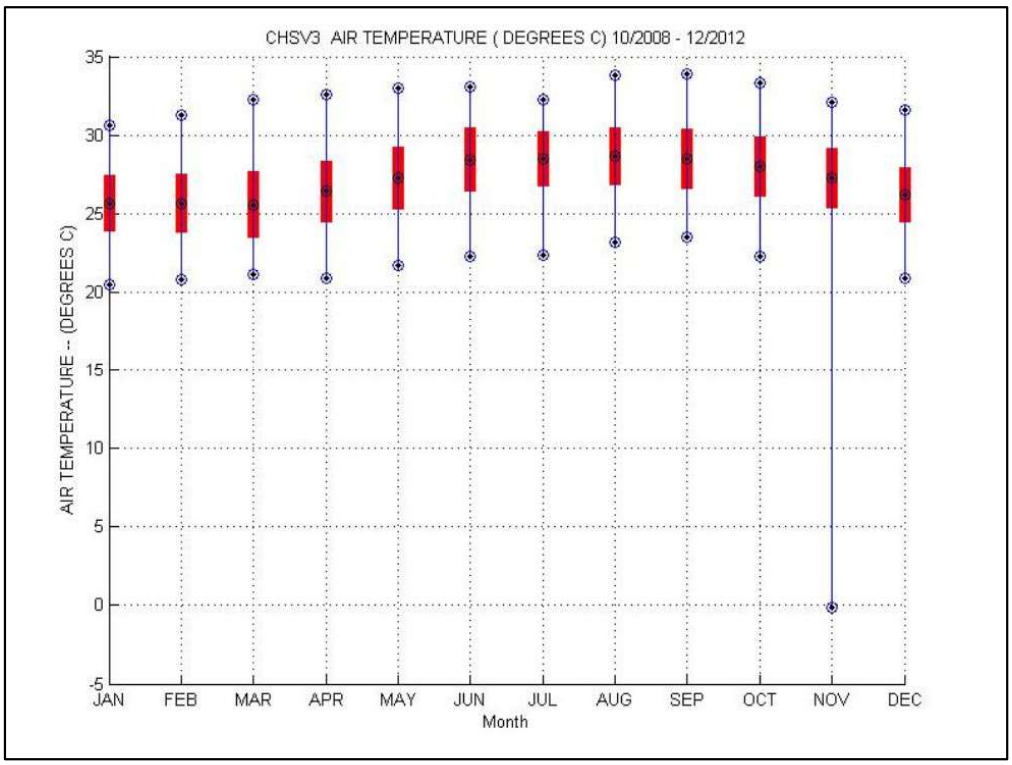


Table 6.01.3 – Average Air Temperature, St. Croix

The average annual rainfall on St. Croix is about 40 inches, ranging from about 30 inches in the east to more than 50 inches in the mountains of the northwest. Average annual temperature is a moderate 79°F, with an average low in winter of 76°F and an average high in summer of 84°F; temperatures are 2 to 3 degrees lower at altitudes of 800 to 1,000 feet. Occasionally maximum daily temperatures will exceed 90°F and minimum temperatures will be less than 70°F. Prevailing wind direction is from the east or northeast.

Rain generally occurs in brief, intense showers of less than a few tenths of an inch. Rains exceeding 1 inch in 48 hours occur about 7 or 8 times a year in the central part of the island; they are slightly more frequent in the mountains of the northwest and less frequent in the eastern part. February and March are the driest months and September is the wettest. Nearly half the average annual rain falls from August through November. Large storms can occur in any month although more likely during July to November, the hurricane season. (Jordan, 1975).

Impact on the Proposed Project

The applicant has carefully analyzed both climate and weather. The project and road rehabilitation have been designed to withstand Category V hurricane events and prevailing climate.

6.02 LANDFORM, GEOLOGY, SOILS AND HISTORIC LAND USE

Geology of St. Croix

St. Croix is the southernmost island of the U.S. Virgin Islands, lying 40 miles south St. Thomas and separated from it by an ocean trench 3,600 meters deep. It lies about 95 miles southeast of San Juan, Puerto Rico. St. Croix is the largest island in the USVI, with a total area of 82 square miles. The island is approximately 22 miles long, east to west and is about 7 miles in width. St. Croix is geographically located in the Lesser Antilles and lies completely within the Caribbean Sea.

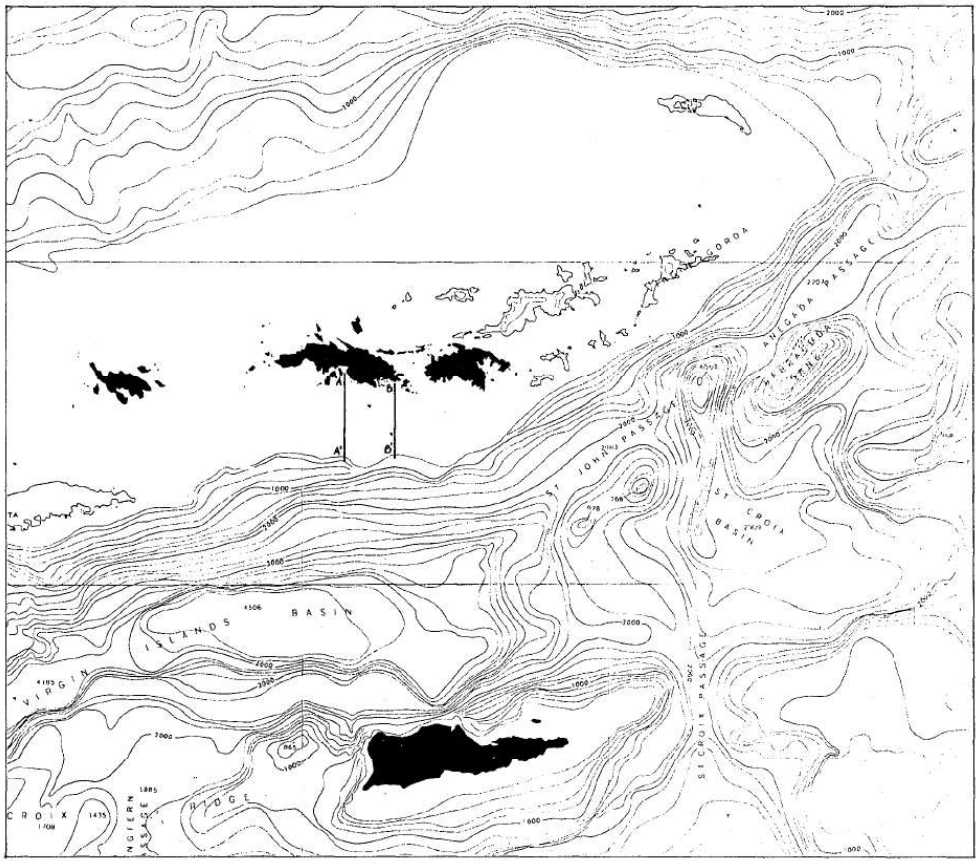


Figure 6.02.1 – Bathymetry of USVI basins and plateaus. From van Eepoel, et al, 1971.

The Virgin Islands are near the northeastern corner of the present Caribbean Plate, a relatively small trapezoidal-shaped plate which is moving eastward relative to the North and South American continents carried on the American Plate. The arc of the Lesser Antilles is an active volcanic arc above a subduction zone in which Atlantic oceanic crust of the American Plate is carried downward under the Caribbean Plate. The Caribbean Plate is sliding past North and South American plates along east-west trending northern and southern boundaries. The western boundary is a subduction zone in which the Cocos Plate is being driven northeastward and down under the edge of the Caribbean Plate west of Central America (Rogers, 1988).

St. Croix lies on a somewhat isolated, submerged ridge separated from the Puerto Rico Bank by the Virgin Islands Basin. Geologically it is related to the islands of the Puerto Rico Bank. If St. Croix was ever connected to the northern Virgins, it may have been separated from that group by either block (Meyerhoff 1927, Whetten 1966) or shear faulting (Adey 1977, Turner 1971).

The oldest rocks exposed on St. Croix are epiclastic volcanic sandstone and mudstone of the Caledonia Formation (Whetten 1966). These weakly metamorphosed, uplifted, folded and faulted rocks were derived from volcanic and other narrow-trench sediments originally

deposited by turbidity currents on the deep ocean floor about 70 to 80 million years ago (Adey 1977). Buck Island is an emergent part of the St. Croix shelf.

Somewhat later in the Cretaceous, one or more volcanoes formed on the sea floor to the south or southeast of St. Croix. Volcanic debris was shed northward to form the Judith Fancy formation, composed of tuffaceous sedimentary rocks, which occur on St. Croix but not on Buck Island.

St. Croix was uplifted above sea level in the Oligocene (Whetten 1974), originally as two islands. The East End Range (including proto-Buck Island) and the Northside Range were separated by a trough several miles wide. The trough was subsequently filled in by the deposition of the Kingshill marl formation. There then followed a period of mild deformation, post-Miocene uplift, and erosion to form the present-day topographic features (Rogers and Teytaud, 1988). Therefore, the island of St. Croix consists geologically of two predominant mountainous areas (the North side and the East End ranges), with a central sediment filled valley in between.

The limestone and marls that overlay the Jealousy formation are known as the Kingshill formation. After these formations were deposited, the area underwent another period of uplifting, the two islands became connected by the newly emergent filled-in area, and the island of St. Croix was formed. Since that time, geologic activity has been limited primarily to the erosion of sediments and the formation of ponds, beaches, reefs, and beach rock coast.

Two large basins, the Virgin Islands Basin and the St. Croix Basin, separate St. Croix from the other Virgin Islands. Within the distance between St. Croix and St. Thomas, about 40 nautical miles, hydrographic charts show that the ascent from the sea floor north of St. Croix is as much as 70º. Frasetto and Northrop (1057) indicate that this northern topographic slope extends downward to the Virgin Islands Basin at a gradient up to 43º. There is an ascent of 13,656 feet within a horizontal distance of 25,800 feet, terminating with the steep north coast in the vicinity of Hams Bluff. The area has been described as the south side of the Anegada Trough and its related fault scarp (Taber 1922). Meyerhoff (1927) suggested that this block faulting took place during the late Pliocene or early Pleistocene, prior to which St. Croix was physically attached to the northern Virgin Islands.

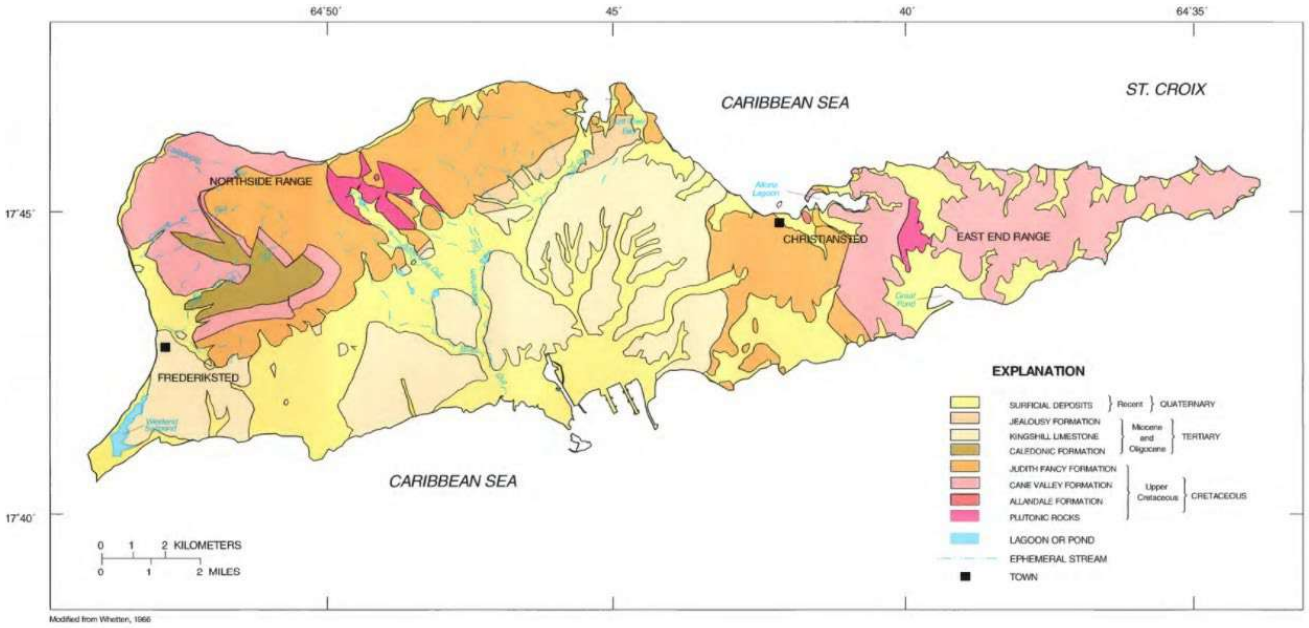
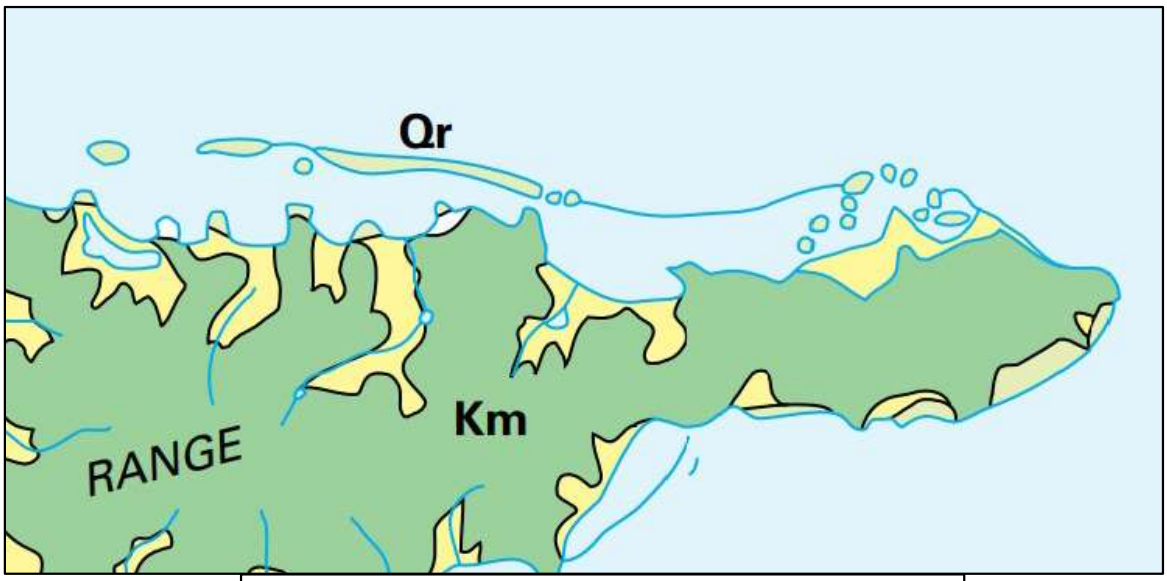


Figure 6.02.2 – General Geological formations of St. Croix (Atlas of Ground-Water Resources in Puerto Rico and the U.S. Virgin Islands)



EXPLANATION

Quaternary deposits

Qab — Alluvium, minor beach deposits

Qr — Reef

Pliocene rocks

Tbf — Blessing Formation

Miocene rocks

Kingshill Limestone

Tmb — Mannings Bay Member

Tlr — La Reine Member

Cretaceous rocks

Igneous intrusive rocks

Kg — Gabbro

Kd — Diorite

Km — Mt. Eagle Group

Contact—Dashed where inferred

Figure 6.02.3 –Geological formations in vicinity of project site, St. Croix. Donnelly, 1959.

Geology of the Facility/Site

The project site is located at 17°45'32.4"N, 64°37'24.4"W, along Route 82, East End Road. The Custom Soil Survey by the National Resource Conservation Service (NRCS) identifies the soil type for the project area as Glynn gravelly loam (GyB). However, to the west of the project area along Rt. 82, the soil type is described as Victory-Southgate (VsF).

Glynn gravelly loam soils are very deep, well-drained, and moderately slowly permeable soils on alluvial fans and terraces. They formed in alluvial sediments weathered from volcanic residuum (National Cooperative Soil Survey). GyB slopes vary from 2 to 5 percent.

Victory-Southgate are deep, well-drained soils are made up of approximately 10 inches of loam, then another 22 inches of very gravelly loam, after which it turns to bedrock. VsF slopes vary from 40 to 70 percent.

Elevation at the project site is fairly consistent at 15 feet above sea level.

Figure 6.02.4 – MapGeo Soil Type Map

Historic Use

The land has been used as a transportation parcel for as long as records have been kept on historic uses.

Seismic Activity

The project will be built to meet or exceed the Standard Specifications for the Construction of Roads and Bridges on Federal Highway Projects requirements for Risk Category IV.

The Puerto Rico/Virgin Islands region is located at the northeastern corner of the Caribbean plate where motions are complex. The westward-moving North American plate is being driven under the Antilles Arc where volcanism is active. On the north side of the plate corner, the North American plate slides past the Caribbean but irregularities in the plate boundaries cause stresses that result in a complicated under thrusting of plate fragments. The interaction of plates causes the volcanism of the Antilles Arc on the eastern boundary of the Caribbean plate and creates major stresses all along the northern boundary (Nealon & Dillon, 2001).

Since the 1867 quake, there has been continuous low intensity activity all below 6.0 Richter. Over the last several years, numerous minor tremors have been felt on the island. This increased activity is associated with the volcanic eruptions that have been occurring to the southeast on the island of Montserrat.

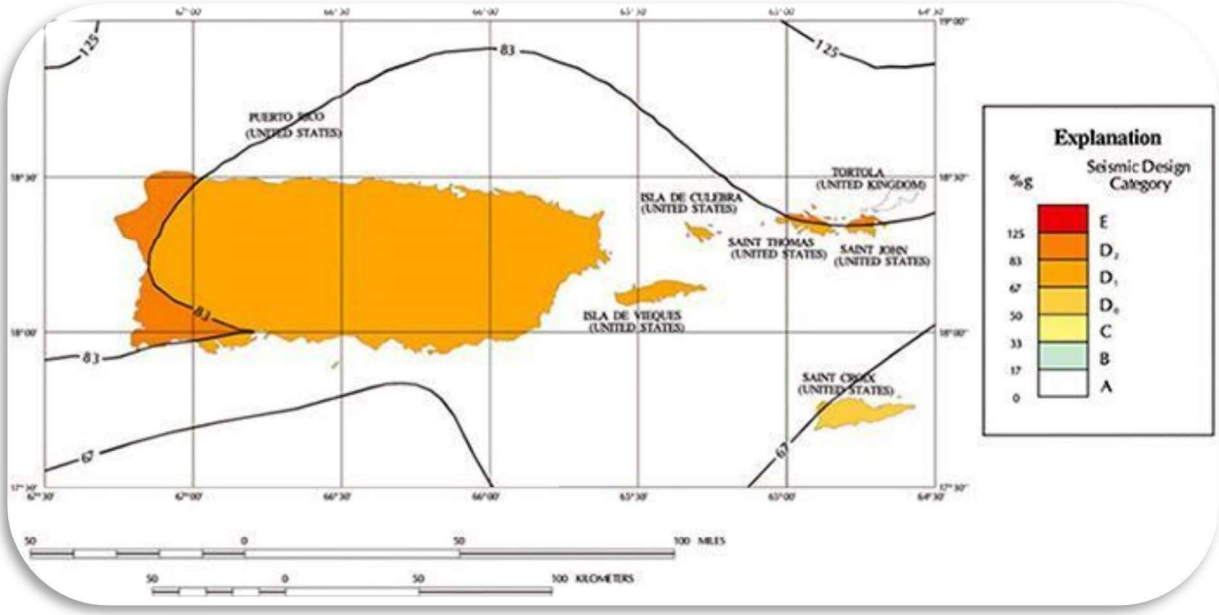


Figure 6.02.5 – FEMA Seismic Design Category Map

Impact of Geology on Proposed Project

The applicant has carefully considered landform, geology, soils and historic land use. The project has been designed to be consistent with these conditions, to improve the landform as it exists now and to cause minimal to no impact on the surrounding area and geology.

6.03 DRAINAGE, FLOODING, AND EROSION CONTROL

a) Drainage Patterns

The road abuts the nearshore beach line in this area, and is in a low-lying, low-sloped area. Based on the existing topography of the site, the project area consists of a major gut/drainage swale to the east, with a minor off-shoot of this course way traveling through the project site.

This off-shoot travels under the road through the existing culverts but have shown to have overflow in heavy storms that travel to the east of the culverts at a low point.

b) Proposed Alterations to Drainage Patterns

There are no proposed alterations to drainage patterns, with the exception of increasing the drainage culverts to minimize flow that travels over the road and along the north/east shoulder.

c) Relationship of Project to Coastal Floodplain

Review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for U.S. Virgin Islands Index shows the site area on Panel No. 7800000074G dated April 16, 2007 to be outside of the flood zone completely.

There are nearby zones (Zone A & Zone AE where 100yr storm elevations have been determined to be 10ft), while the area immediately along the shoreline is in VE where 100yr storm elevations with velocity (wave action) have been determined to be 14ft.

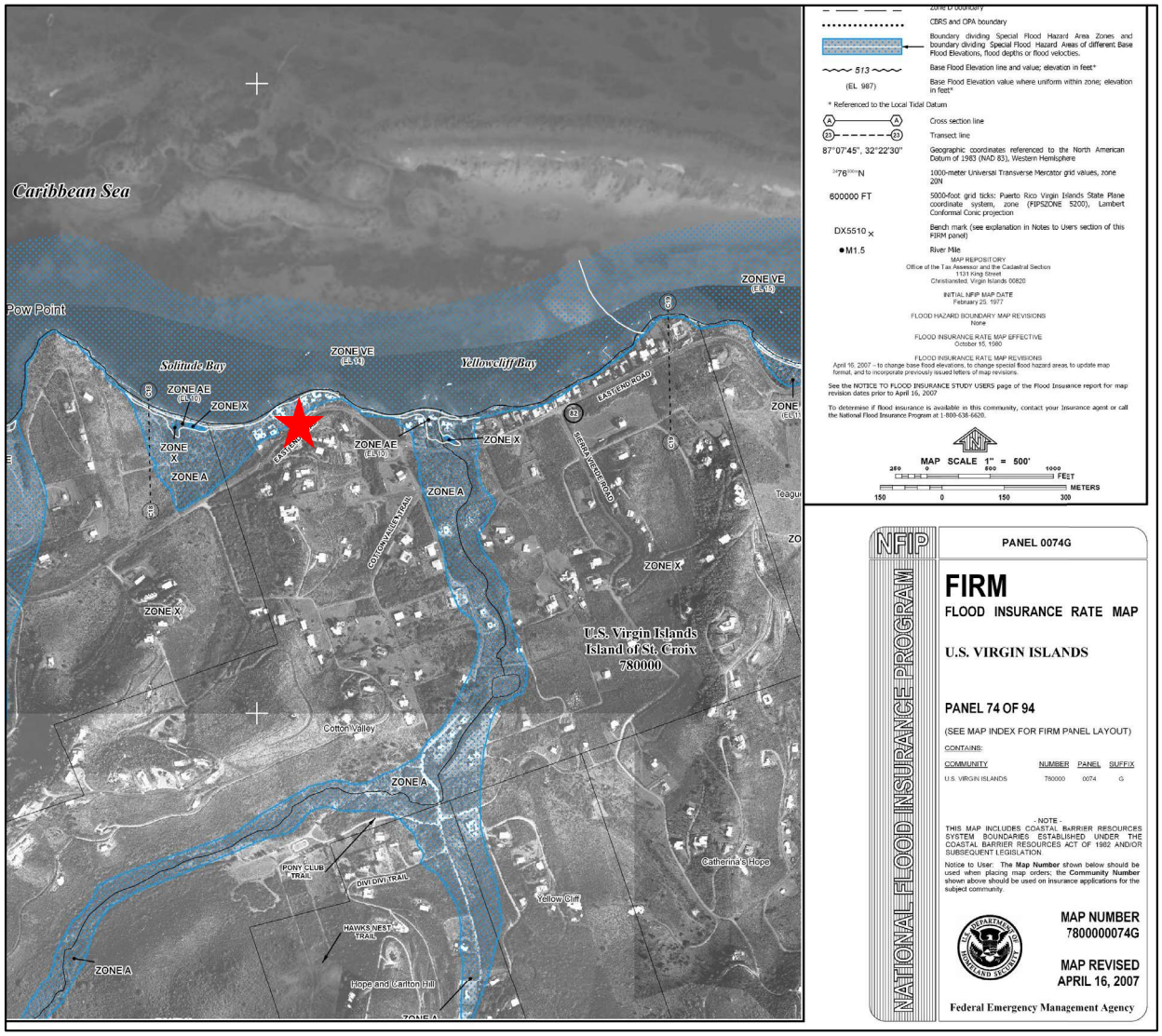


Figure 6.03.1 – Flood Insurance Rate Map (FIRM) for Project Area. April 16, 2007

d) Peak Stormwater Flow Calculations

An H&H study was conducted on the project location, estimating flows through the area based on storm frequency data available. Modeling software was used to estimate Peak Discharge rates for 1, 2, 5, 10, 25 and 100 year 24-hour storm events. Using the LIDAR contours for the basin area and the Rational method, the runoff was calculated for these storm events. Curve number was determined to be 78, over the entire contributing watershed amounting to approximately 68.59 acres.

The following are discharge rates at this project site:

PEAK DISCHARGE RATE TABLE							
Storm Frequency	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100YR
Peak Discharge Rate (cfs)	115.10	153.72	191.77	219.63	280.07	338.14	385.64
Rainfall (in/hr)	2.10	2.80	3.50	4.64	4.00	5.14	5.62

Rational Method (LAT:17.758889, LON:64.623389)

Figure 6.03.2 – Peak Discharge Rates for 1-yr thru 100-yr 24-hour storm events.

e) Existing Stormwater Disposal Structures

The existing storm water structures entail a drainage swale that off-shoots from the primary major gut to the east, and is a vegetated swale connecting to the existing road headwall and cast-iron culvert. The low-lying project area will overtop in heavy rain events and sheet flow across to the northern shoulder, where it meets the rocky/sandy soils of the shoreline.

The existing storm water culvert has a capacity of 40.17 CFS, which does not meet 1 year 24-hour runoff peak flows. In order to improve the discharge rate to a 2 year storm capacity, the existing 30-inch culvert will be replaced with a 4'x8' box culvert.

f) Proposed Stormwater Control Facilities

This project proposes to remove the existing culvert and a new box culvert installed. The stone wall headwall will be kept and integrated into the drainage structure, but a new spillway will be included at the culvert outlet. The project itself will allow for improved performance during flood conditions, as a strengthened shoulder will be installed, improved subbase laid down and asphalt layers applied with a crown profile for improved drainage.

The existing 30-inch metal culvert will be replaced by a 4'x8' box culvert structure and riprap spillways. The proposed box culvert structure will convey up to 250 CFS, which includes the 25-year 24-hour storm event.

No other changes to stormwater flows, quantities or direction are proposed for this project, with the exception of the above culvert modification. Management of stormwater for the duration of the project will be limited to ensuring no discharge of contaminated stormwater from the site boundaries, and prevention of erosion of project areas through controlled release from site discharge points.

g) Maintenance Schedule for Stormwater Facilities

Sediment control devices, including dikes swales, and outlets, will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing, and in accordance with the approved SWPPP requirements. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

After construction is complete, a maintenance schedule will be prepared and submitted to the VI Department of Public Works for use in their routine O&M plan for stormwater infrastructure.

h) *Proposed Method of Land Clearing*

The brush and debris will be removed by cutting and disposing of vegetation as green waste at the Anguilla Landfill Transfer Station. Earth work will be limited to scraping road surface, excavating the collapsed road section, and grading the washed out road shoulder.

i) *Provisions to Preserve Topsoil and Limit Site Disturbance*

Topsoil and site disturbance will be minimized during the construction timeline. The project will stay almost exclusively within the existing footprint of the road along the 200-foot length. Some soil removal and compaction will occur at the north edge of the road, to stabilize for the additional riprap placement. Shoulder grading and shaping will occur to achieve correct profile for long-term drainage.

The site will otherwise see no topsoil or site disturbance, and compaction of subbase will occur before asphalt layers are placed down.

A stringent Storm Water Pollution Prevention Plan (SWPPP) will be implemented during project activities.

j) *Critical Areas and Possible Trouble Spots*

The project area is directly adjacent to the shoreline, with several properties in the vicinity. Due to the proximity to the water, the clearing of debris and repair of the roadway must not cause any negative impact to the surrounding shoreline or drainage features.

Site slope is minimal at 2-5%. However, there are some dramatic increases of 40-70% slope just off the road footprint along the gut and stormwater channel. Elevation average is 15 feet above sea level.

A review of Endangered Species in the area, using the USFWS Information for Planning and Consultation (IPaC) Tool, indicates there are no endangered terrestrial species within the proposed project site but identifies two federal endangered sea turtle species that are known to swim in the offshore waters north of the project area. These include: hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) turtles. In addition, the

West Indian Manatee (*Trichechus manatus*) has also been found in the offshore water near the project site and are a threatened species.

In review of the 2018 VI DPNR Integrated Report, water quality in the direct receiving area is currently Unknown due to lack of sampling stations in the area.

Due to the nature of the project scope of road rehabilitation, there exists potential for sedimentation and erosion during project activities. However, appropriate protective Best Management Practices (BMPs) will be employed through the entire project timeline in accordance with minimum requirements of the VI Environmental Protection Handbook (2002), and as the project footprint is essentially identical to the existing infrastructure, there are no anticipated impacts to stormwater and air quality.

k) *Erosion and Sediment Control Devices to be Implemented*

The following Best Management Practices (BMPs) will be implemented on the site to control runoff and protect natural resources:

Silt Fence – Due to the close proximity to the shoreline, silt fencing shall be used to protect the shoreline and surface water from runoff and sediment loss on the north side along the beach/sand line.

Containment Berms– A containment berm will be constructed to if needed support silt fencing in containing stormwater and retaining sediment.

All BMPs will be installed and maintained to the minimum standards found in the VI Environmental Protection Handbook (2002).

l) *Maintenance of Erosion and Sediment Control Devices*

Sediment control devices, to include dikes, swales, and outlets, will be every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed in accordance with the approved SWPPP requirements.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

m) Impacts to Terrestrial and Shoreline Erosion

The project site is located directly adjacent to the shoreline, along the northside of St. Croix.

The proposed development will not alter the existing drainage patterns of the site. This project's storm water runoff will drain by sheet flow to the both sides of the road and shoulder swales. The drainage of storm water along the north side will flow directly over the shoulder to the beach/sand line. Silt Fencing will be set up with reinforcing berms as needed to ensure catchment of direct runoff from the project area, thereby minimizing potential impact to the shoreline and receiving waters. These discharges enter Yellowcliff Bay, classified as Class B waters.

All standard sediment and erosion control devices and Best Management Practices (BMPs) will be implemented when performing any site work and will be maintained throughout the life of the project.

A rip rap and gabion basket matting structure will be installed along the north/east shoulder of the project site, providing long-term erosion control and stability for the drainage area. These permanent BMPs shall be maintained by DPW according to standard practices on a regular schedule and after storm events.

The site is fully developed consisting of 95% of either impervious asphalt or flat packed earth surface. The majority of active area has a slope grade of approximately 5%. Currently, rainfall sheet flows across the site, and drains off the north shoulder either directly or further to the west.

Sediment and erosion controls will be implemented to effectively control drainage patterns, diverting runoff to existing outfalls that are protected by silt fencing.

These erosion control devices, combined with the receipt of a VI CGP storm water coverage and routine inspections, maintenance and repairs, will ensure no impact to either terrestrial or shoreline erosion.

6.04 FRESH WATER RESOURCES

St. Croix, USVI is limited in the number of freshwater resources to a few wells located around the island and mostly intermittent and ephemeral streams and ponds which dry up during periods of limited rainfall. Some perennial streams and freshwater ponds/basins do exist, but not as a reliable source of freshwater. The majority of potable water is either captured by rooftops and stored in cisterns or is desalinated seawater. The project will use freshwater only for grading, compaction and general dust control needs. The project will have no negative impact on the availability of freshwater resources.

6.05 OCEANOGRAPHY

a) Seabed Alteration

No alteration or impact to the existing seabed is anticipated as part of this project and operation.

b) Tides and Currents

The surface currents throughout the Caribbean are driven by the North Equatorial Current that runs through the islands west-northwest and then joins the Gulf Stream (Figure 6.05.a-F.2). These currents change very little from season to season with the currents coming more from the south during the summer months. Because of the shallowness of the Caribbean basin, less than 3200 feet, mainly surface water from the Atlantic flows through the islands (Figure 6.05.1). Currents have been observed at Christiansted Harbor ranging between 1 and 3 knots, depending on weather conditions (IRF 1977).

St. Croix's tides typically exhibit two (bi-modal) 'peaks' during the diurnal period (24-hour day), with the second (lesser) 'peak' with relatively small ebbs and flows. The mean tides range from 0.8 feet to 1.0 feet and the spring tidal ranges reach up to 1.3 feet (IRF 1977).

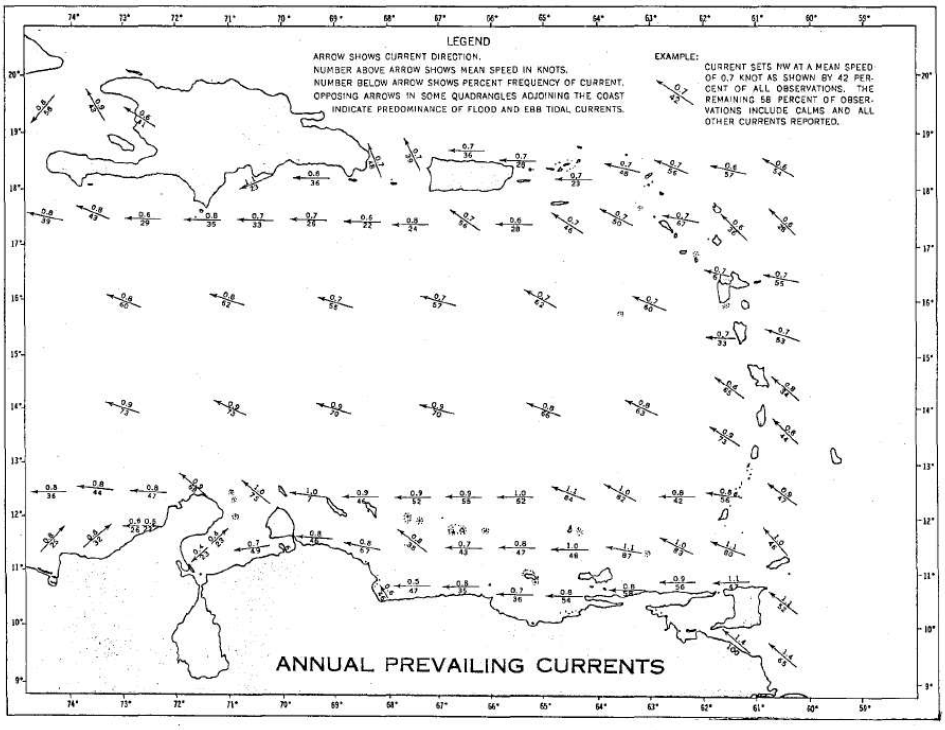


Figure 6.05.1 – Annual prevailing currents in the Caribbean. US Naval Oceanographic Office (1963)

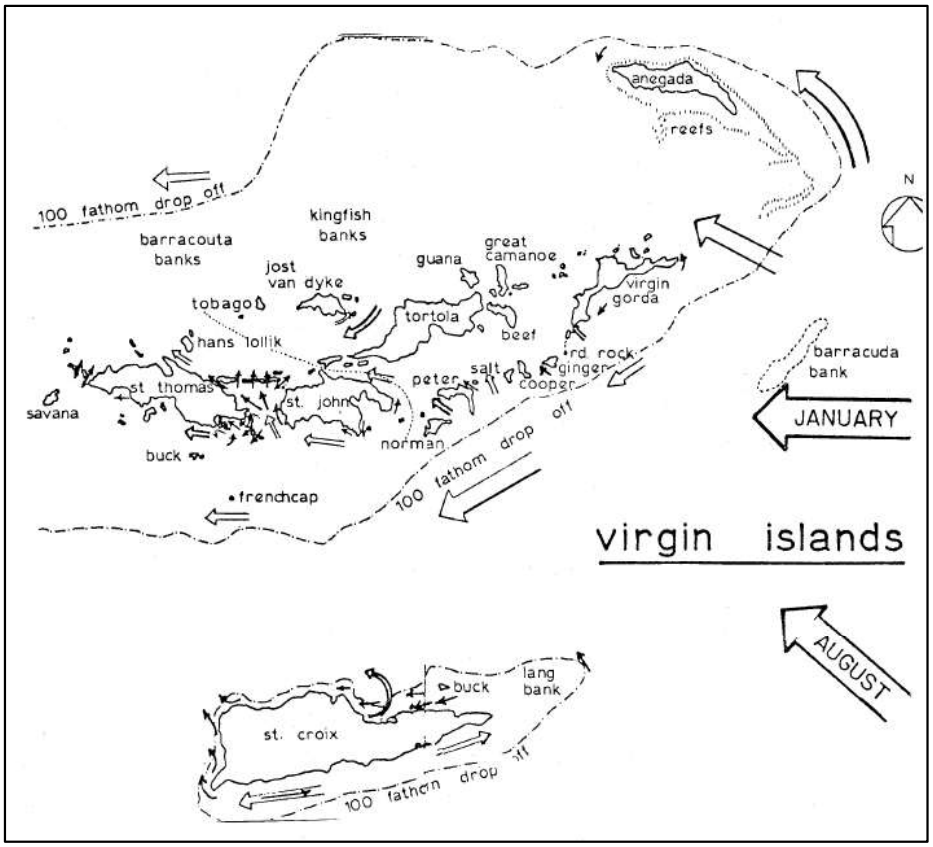


Figure 6.05.2 – General current patterns on the island platforms. From Dammann, et al (1969)

In the Virgin Islands, tidal ranges are not great, and tidal currents, except in some inshore localities, are not significant. The small islands, lacking complex shoreline physiography, do not restrict changes in water level. The sea flows around the islands relatively unimpeded, resulting in tidal fluctuations of only a few inches to a foot. Further, the steep slopes of the islands rising out of the water means that the intertidal zone – the part of the shoreline regularly covered and uncovered by the tides - is very narrow. We therefore do not have large areas of tidal flats uncovered at low tides as in other places in the world, especially along continental coastal zones.

One of the consequences of this small tidal action is that water exchange in bays due to tidal action is usually very small. For example, it is estimated that 24 to 40 tidal cycles alone would be necessary to exchange all the water in the main part of St. Thomas harbor (Percious, et al, 1972). Fortunately, waves, swells and oceanic currents usually do a good job of flushing most bays. However, these forces are considerably reduced by the time they reach the heads of deep embayments.

As a result, circulation may be poor in the inner reaches of some of our larger embayments. The innermost portions of the mangrove lagoon on St. Thomas, of Salt River, St. Croix and of Coral Bay, St. John are like this. To a lesser extent, similar conditions have been observed at the head of Vessup Bay (Redhook), St. Thomas and Cruz Bay, St. John, and probably occurs in other similar locations (IRF, 1977).

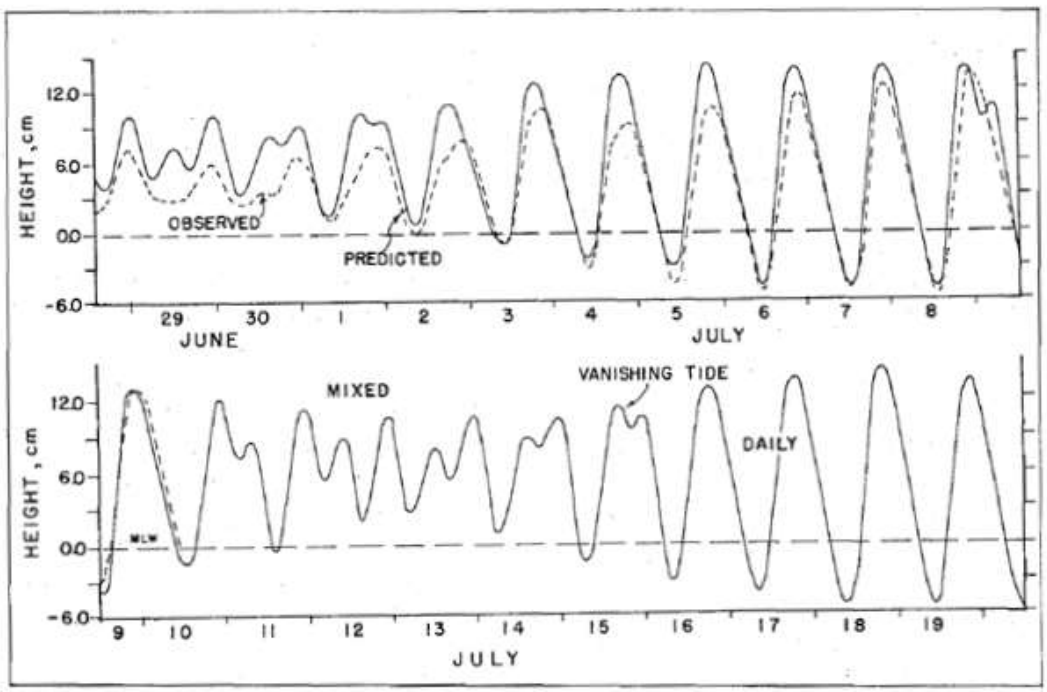


Figure 6.05.3 – Variations in the character of the tide displayed in time-height curves, from predicted tables and from observed tides in Christiansted harbor, June 29 - July 19, 1971. From Nichols, et. at, 1972.

The closest NOAA tidal station is located in Christiansted Harbor, St. Croix, VI and is Station ID: 9751364. The NOAA tidal station is located at Latitude: 17° 44.9' N and Longitude: 64° 41.9' W. The mean range is 0.69 ft. and the diurnal range is 0.74 ft. Tidal data from the station is shown below.

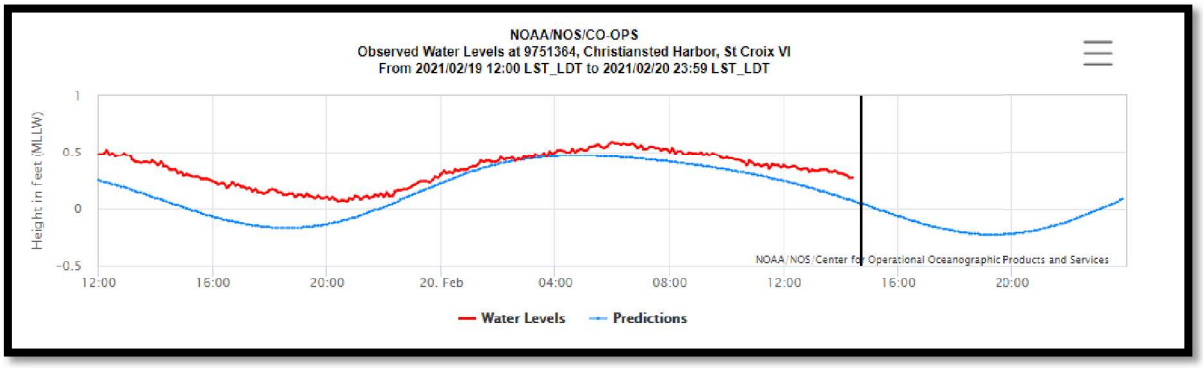


Figure 6.05.4 – Observed Water Levels in Christiansted, St. Croix

c) Wave and Wind Impacts

Due to the location and elevation, there are no anticipated wave or wind impacts for this project or operation.

d) Marine Water Quality

The water surrounding the site is classified as Class B which includes uses such as the propagation of desirable species of marine life and primarily contact recreation such as swimming, water skiing, etc.

The waterbody to the north of the project site is Yellowcliff Bay, a Class B Water. Water quality criteria, noted in 12 VIRR 186, include dissolved oxygen not less than 5.5 mg/l from other than natural conditions. The pH must not vary by more than 0.1 pH unit from ambient, and at no time may the pH be less than 7.0 or greater than 8.3. Bacteria (enterococci) cannot exceed 30 CFU/100ml (30-day geometric mean), turbidity readings cannot exceed 3 NTUs, and clarity may not exceed a level where a secchi disc cannot be visible at a minimum depth of one meter.

VI DPNR performs routine water quality measurements at the following Water Quality Monitoring Stations:

Waterbody	Location	Sample Station Number
VI-STC-38	Solitude Backreef	None

In VI DPNR's 2018 Integrated Report (IR), which entails CWA Section 305(b) water status report and the CWA 303(d) list, the subject waterbody shows no available water quality data and therefore, the status of the water quality at the site is Unknown.

A Total Maximum Daily Load (TMDL) for this waterbody has **not** been established for this waterbody.

Impact of the Proposed Project

The applicant has carefully considered operations onsite and how it would affect water quality. Existing operations has been setup carefully to control stormwater runoff from the site, and direct all of it to regulated and controlled discharge points.

A stringent sedimentation and erosion control plan will be implemented and monitored during the life of the operation. As discussed in Section 5.01, stormwater both during construction and after construction will be strictly managed and discharged pursuant to a TPDES stormwater permit requiring regular monitoring and reporting to ensure permit compliance.

6.06 MARINE RESOURCES AND HABITAT ASSESSMENT

Existing shoreline near the site is mostly composed of vegetation. The project site is located on the east end of the island of St. Croix. The area is comprised most of a number of residential estates with single family homes in the area and no major commercial nor industrial zones. The largest operations along the east end are mostly condominium and hotel operations. Therefore, there is minimal development and fewer anthropogenic sources of pollution.

NOAA and DPNR have established the area as the St. Croix East End Marine Park (STXEEMP), which includes the water body directly adjacent to the project site, as a Coral Reef System Area of Particular Concern (APC) and designated for management intervention in the 2020-2025 United States Virgin Islands' Coral Reef Management Priorities document. Figure 6.06.1 below indicates the sites prioritized for protection and management.

According to the most recent STXEEMP Watershed Management Plan (September 2016, v1), the primary threats to this managed area are anthropogenic sources of pollution coming from trash, soil erosion and overfishing. This project will mitigate the effects of soil erosion and sedimentation with the proposed improvements to the site and anticipates no negative effect from the project activities or long-term design.

During construction, VIP will mitigate the effects of soil erosion, sedimentation and trash by following a strict SWPPP addressing those issues and will ensure no negative effect during the work schedule.

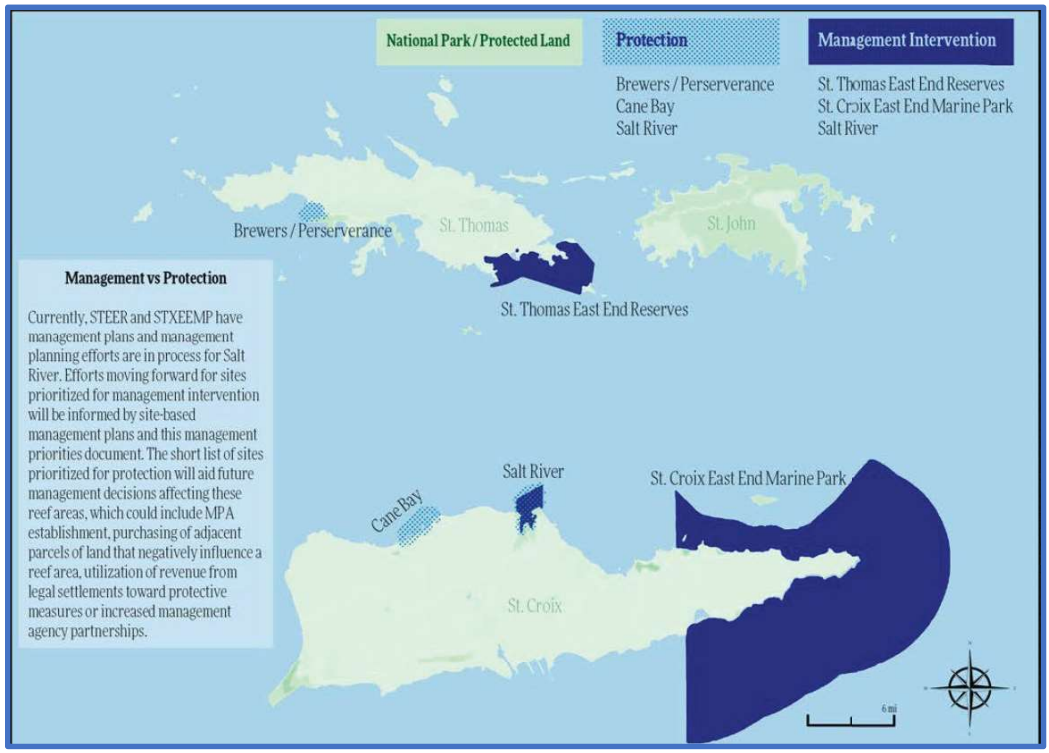


Figure 6.06.1 Prioritized Sites for Intervention and Protection, United States Virgin Islands' Coral Reef Management Priorities 2020-2025

A review of the 2002 NOAA Benthic Habitat Maps shows the majority of the surrounding habitat is a majority of seagrass (70-90% coverage) and a sliver of Reef/Colonized Bedrock. No negative impact to either of these types of marine habitat are anticipated as part of this project.

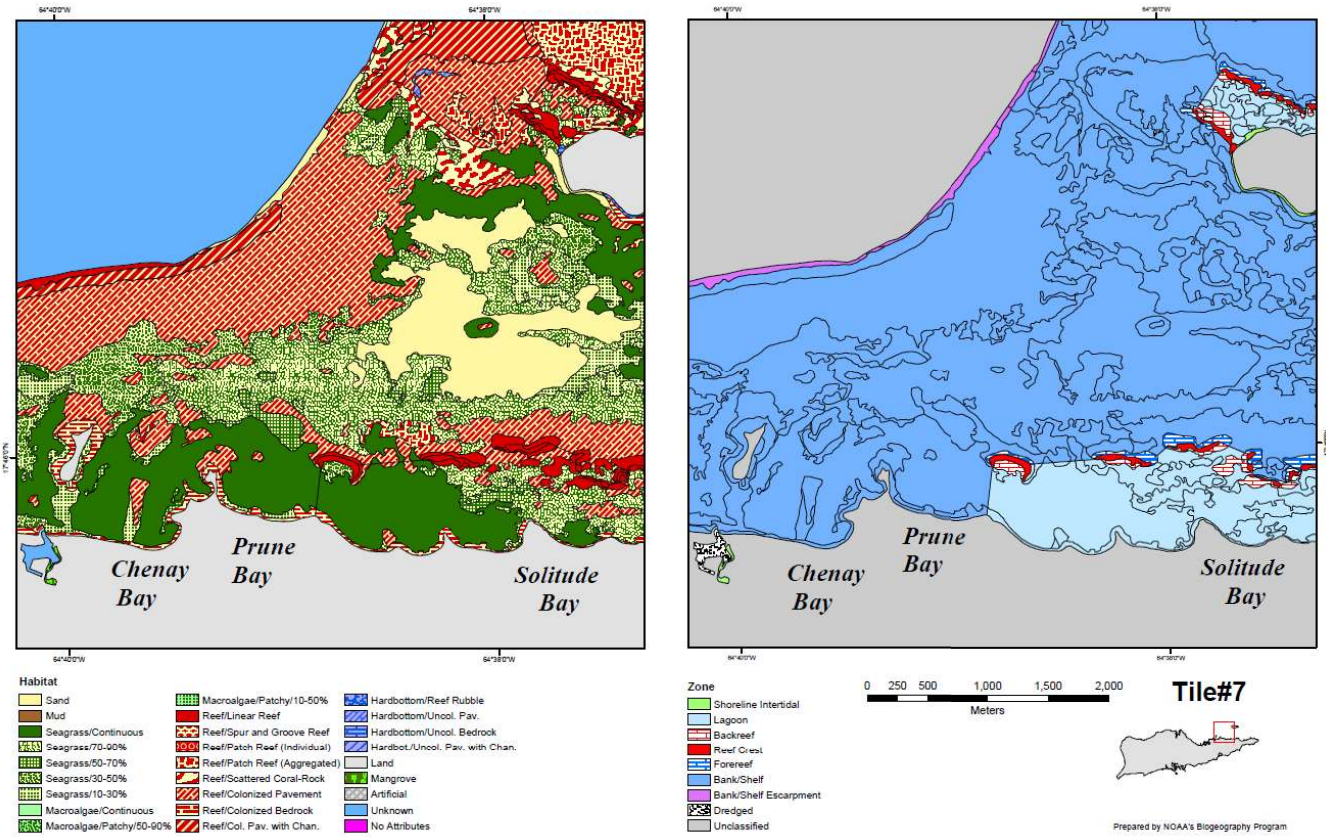


Figure 6.06.2 – 2002 NOAA Benthic Habitat Maps, North Shore St. Croix, USVI.

A review of Endangered Species in the area shows no listed or nominated coral species in the area. Two federal rare and endangered sea turtle species are known to swim in the offshore waters south of the project area. These include: hawksbill (*Eretmochelys imbricata),* and leatherback (*Dermochelys coriacea*) turtles. In addition, the West Indian Manatee (Trichechus manatus) has also been found in the offshore water near the project site and are a threatened species.

No negative impacts to these noted threatened or endangered species is anticipated by the proposed project.

6.07 TERRESTRIAL RESOURCES

An assessment by Horsley Witten's Senior Ecologist at the site showed no specific species or habitat of particular concern, though any issues concerning presence of species that arise during work will be brought to the attention of VIDPNR Fish & Wildlife Division as well as USFWS.

The Environmental Sensitivity Index (ESI) Map for the St. Croix island notes no specific habitat of particular sensitivity in the area, as show in Figure 6.07.1 below.

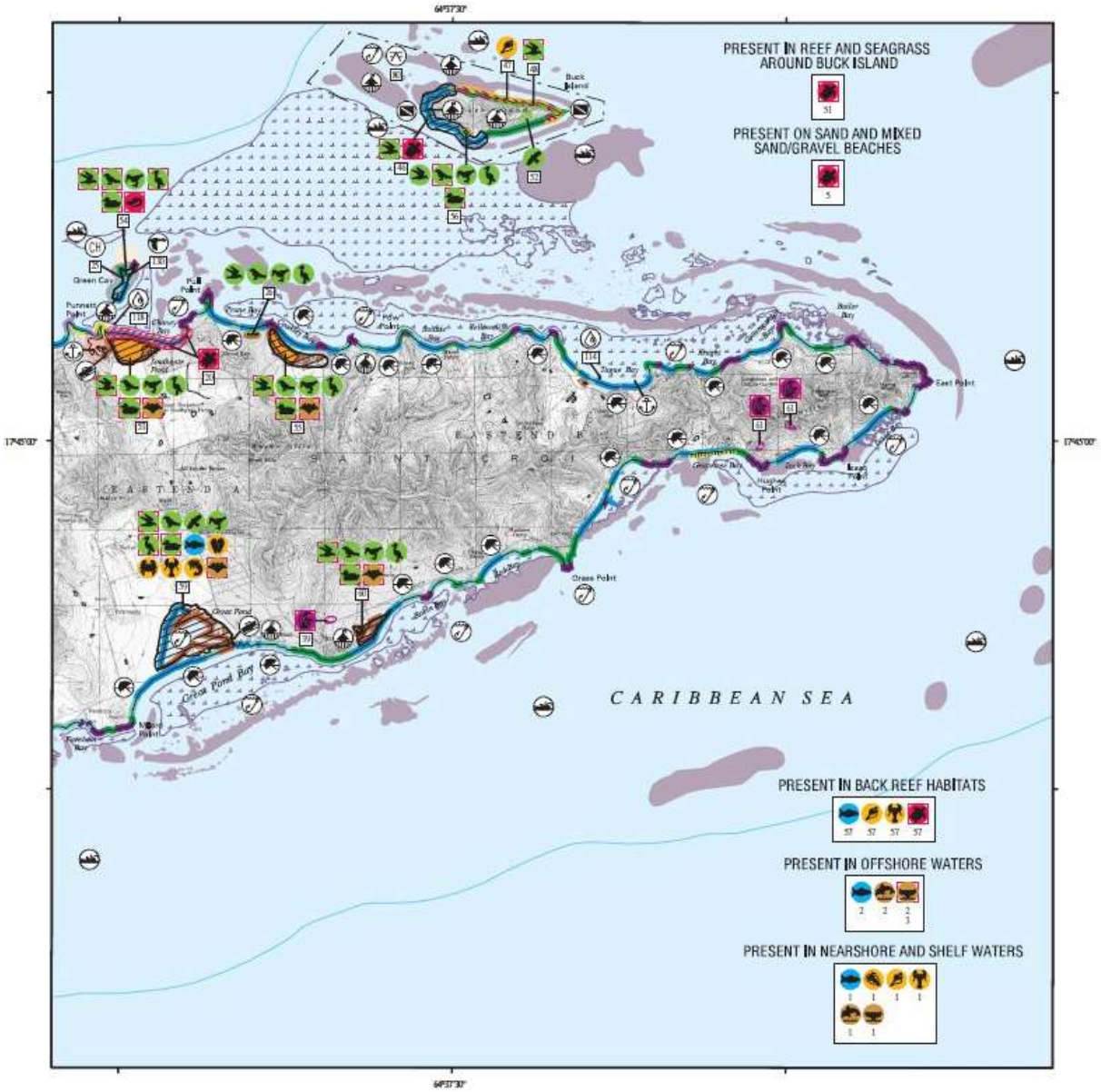


Figure 6.07.1 – Environmental Sensitivity Index Map, St. Croix, USVI.

The project site is a roadway for transportation uses. The north shoulder is comprised of natural bush and small trees. There is an existing cast iron culvert below the road to allow the exit of stormwater overflow.

Impact of the Proposed Project

VIP will minimize the footprint of work to the greatest extent possible and is not expected to extend farther than 10 feet beyond the road shoulder and culvert location.

The site will see very little expansion beyond the existing footprint with the exception of increased height of the roadway, to allow for larger culvert installation, and additional rip rap and gabion baskets along the shoulder and culvert outlet. As compliance with both stormwater and air pollution permits will be ensured throughout the life of the project, there are no anticipated negative impacts to these species or their habitat, neither in the nearshore waters nor on land.

6.08 WETLANDS

The U.S. Army Corps of Engineers defines wetlands as "those areas that are periodically inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, bogs, marshes and similar areas." (U.S. Army Corps of Engineers, 1986).

There are no terrestrial wetlands within the project area, though it is within 50 feet of the mean high-tide line.

6.09 RARE AND ENDANGERED SPECIES

There are no rare or endangered species directly on the site, and the site is not critical habitat. However, two federal endangered sea turtle species that are known to swim in the offshore waters north of the project area. Those species are the hawksbill (*Eretmochelys imbricata*) and the leatherback (*Dermochelys coriacea*) turtles. The West Indian Manatee (Trichechus manatus) has also been found in the offshore water near the project site and are a threatened species.

The construction and use of the roadway and related infrastructure will have no anticipated impact on rare or endangered species. As such, the permitting of this project will not displace any rare, endangered, or threatened species from any critical habitat.

VIP will minimize the footprint of work to the greatest extent possible and is not expected to extend farther than 6 feet beyond the road shoulder and culvert location. This will ensure minimal to no impact to the nearshore and any potential turtle species in the area.

6.10 AIR QUALITY

No air quality issues are anticipated for this project. A minimum of soil exposure and earth movement will occur at the site by repairing and replacing the roadway, headwalls, guardrails, and culvert. Stockpiling will be protected and kept to a minimum. If work is done during particularly dry and/or windy conditions, a water truck can be used to wet down the

area to prevent fugitive dust from leaving the site. Dust control measures to ensure no air quality issues arise are outlined in the Storm Water Pollution Plan for this project.

7.00 IMPACT OF THE PROPOSED PROJECT ON THE HUMAN ENVIRONMENT

7.01 LAND AND WATER USE PLANS

The property is a Right of Way (ROW) zoned plot, designated for transportation, which permits the rehabilitation project proposed for this site.

The project will not change the current use of the property as an ROW.

7.02 VISUAL IMPACTS

The property is proposed for an existing road and will improve the contour and quality of the road in this section. The new guardrail and headwalls will provide visual assurance of safety while driving. The new culverts will have no adverse visual impacts. The project will not change the visual character of the area.

7.03 IMPACTS ON PUBLIC SERVICES AND UTILITIES

Water

As noted in Part 6.04, the project will not use nor affect significant amounts of water, either from public supply or otherwise. The project will have no negative impact on the availability of freshwater resources.

Sewage Treatment and Disposal

There will be no flow to the municipal sewerage system or required sewer disposal resulting from this project's implementation. As previously referenced, project sewage management will be limited to maintaining portable restrooms.

Solid Waste Disposal

Domestic solid waste will be managed with onsite waste bins. It will be trucked out by VIP as necessary and disposed of in accordance with solid waste requirements.

Roads, Traffic and Parking

The project will affect traffic as the scope of work is to rehabilitate a 200-foot section of the road. Traffic will be minimized with the use of traffic guidance, shoulder passing and a short work schedule.

Electricity

The property will not have any electricity needs related to existing infrastructure.

Schools

There are no anticipated adverse effects on the local educational system.

Fire and Police Protection

Any nighttime work will provide adequate lighting for worker safety. In the case there is an emergency, Cotton Valley Fire Station is located less than 500 miles from the project site.

Health

The property will not have any adverse effects on the public health, nor increase the use of public health facilities. The facility will follow all air permit requirements to ensure air pollution is minimized and does not affect any neighboring properties or businesses.

7.04 SOCIAL IMPACTS

There are no anticipated negative social impacts to the area. The road rehabilitation will address damages to the roadway, headwalls, guardrails and potentially under designed culvert, which will ensure effective access and transport through this essential route.

7.05 ECONOMIC IMPACTS

There are no anticipated negative economic impacts.

7.06 IMPACTS ON HISTORICAL AND ARCHAEOLOGICAL RESOURCES

This project site shows no indication of historical resources or any historical structures. A clearance was provided to the USDOT by DPNR-SHPO for this and 14 other project sites as

part of this overall project scope, and found that no impact to historical resources was anticipated, based on the proposed scope of work and rehabilitation methods.

7.07 RECREATIONAL USE

The project will have no impact on the recreational uses within the area. As noted above, traffic to areas in the vicinity will be slowed, but not prevented, for the project duration. The project will ensure unimpeded use of the area after the project is complete, to allow for continued recreational activities in the area.

7.08 WASTE DISPOSAL

Domestic solid waste will be managed with onsite waste bins. It will be trucked out by VIP as necessary and disposed of in accordance with solid waste requirements.

Chemicals inherent to the asphalt and road construction business will be used daily on site. They will be kept in protected areas and any hydrocarbons will be kept within secondary containment (such as hydraulic or motor oil for machinery).

Any unused or contaminated chemicals or materials, including oily rags or contaminated material, will be disposed of in accordance with waste handing regulations.

The project will have no significant impact on solid waste disposal.

7.09 ACCIDENTAL SPILLS

Spills are not anticipated during construction; however, any spills onsite will be cleaned up immediately. Any contaminated soil will be put into approved containers for eventual disposal by a licensed waste handler.

7.10 POTENTIAL ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

The project does not involve any potential adverse effects that may not be avoided. The project has been designed to avoid sensitive areas to the greatest extent possible. Potential impacts have been minimized through the development of a stringent sedimentation and erosion control plan which will be implemented during construction and during the life of the site operations.

8.00 MITIGATION PLANS

No mitigation plans are needed for this project and operation.

9.00 ALTERNATIVES TO PROPOSED ACTION

If the operation does not move forward, the project site and road length will continue to degrade and will create extremely unsafe conditions for drivers, eventually cutting off access through this roadway. If the guardrails are not replaced, this could potentially cause a vehicle and its occupant to incur unnecessary damage if vehicle control is lost. If the culvert and headwalls are not replaced, future storm events, large and small, could cause continued damage to the roadway.

There is no alternative location option, as the damaged roadway and related infrastructure must be repaired and replaced. There are no easy alternative roadways in the area to traverse the length of the north shore.

10.00 RELATIONSHIP BETWEEN SHORT & LONG TERM USES OF MAN'S ENVIRONMENT

Any minor potential impacts associated with this project in the short term are far outweighed by the environmental and economic benefits provided in the long-term to repairing this section of road.

11.00 REFERENCES

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NOAA Historical Hurricane Tracks https://coast.noaa.gov/hurricanes

FEMA Flood Map Service Center: https://msc.fema.gov/portal/home

NOAA Tides and Currents: https://tidesandcurrents.noaa.gov/map/index.shtml?id=9751364

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